

What is claimed is:

1. A method for maintaining and supplying stable power to a skin care device, comprising a DC-DC converting unit (20, 120) for escalating the voltages from a charged battery power source (1, 101), a skin-stimulating unit (50, 150, 151) including a supersonic element or ion-inducting element, a switch unit (30, 130) having a main switch and various functional switches, an LCD displayer (40, 140) for indicating the operating mode, and a CPU (2, 102) for controlling the above components, the method comprising the following steps:

(a) starting a pulse width measuring program (PWM_CHECK) by setting a certain pulse width (S1), and checking whether the pulse width is correctly operating within the set width (S2);

(b) detecting the operating pulse width ('PWM OK FLAG'=1); if operated in the setting pulse width, returning to continue the operation; and, if not operated in the setting width, comparing the current operating width ('PWM_PUF) with the setting width ('PWM_TARGET) (S3);

(c) if the compared value of the operation and setting widths has no difference ('PWM_PUF - 'PWM_TARGET = 0), returning to continue operation; if it has a difference, initiating PWM adjustment;

(c1) determining whether the duty ratio of the operating pulse width is the same as that of the set pulse width (S4);

(c2) increasing the duty ratio of the PWM by the difference between the detected duty ratio and the setting duty ratio, if the detected duty ratio of the pulse width is smaller than that of the setting pulse width (S7); and

(c3) decreasing the duty ratio of the PWM by the difference between the detected duty ratio and the setting duty ratio, if the detected duty ratio of the pulse width is larger than that of the setting pulse width (S8).

2. An apparatus for maintaining and supplying stable power to a skin care device, comprising

a DC-DC converting unit (20, 120) for escalating the voltages from a charged battery power source (1, 101);

a skin-stimulating unit (50, 150, 151), including a supersonic element or an ion-inducting element;

a switch unit (30, 130) having a main switch and various functional switches;

5 an LCD displayer (40, 140) for indicating various operating modes;

a CPU (2, 102) for controlling each component;

a voltage-measuring unit (R2, R3) for measuring the voltage of said DC-DC converting unit; and

10 a switching element (D3) for controlling the pulse width (PWM) according to the duty ratio signal from the CPU.

3. An apparatus for maintaining and supplying stable power to a skin care device as claimed in claim 2, further comprises a PWM control signal function, which prolongs a switching-on stage by gradually increasing the voltage up to the
15 operating voltage during the step-up stage, and inversely shortens the switching-off stage by gradually decreasing the operating voltage during the step-down stage.

4. An apparatus for maintaining and supplying stable power to a skin care device as claimed in claim 3, further comprises a skin contact sensing unit for
20 detecting contact of a vibrating part with the user's skin and a function of automatic step-up to the operating voltage when said skin detecting unit senses contact with the user's skin.

5. An apparatus for maintaining and supplying stable power to a skin care
25 device as claimed in claim 4, further comprises a safety control signal function, which rapidly shuts off power when it detects an unusual operation, overheating or an electric hazard.

6. An apparatus for maintaining and supplying stable power to a skin care
30 device as claimed in claim 5, further comprises a portable skin care device.

7. An apparatus for maintaining and supplying stable power to a skin care device, comprising

a DC-DC converting unit (20, 20', 120) for escalating the voltages from a charged battery power source (1, 101),

5 a skin-stimulating unit (50, 150), including a supersonic element or an ion-inducting element,

a switch unit (30, 130) having main switch (SW1) and various functional switches,

an LCD displayer (40, 140) for indicating various operating modes,

10 a CPU (2, 102) for controlling each component, and

a main switch initiating unit having a function that, when said main switch (SW1) is turned on, said CPS is activated by a switching signal inputted to an analogue input port from said CPU, first switch unit (31, 31', 131) is activated by said CPU through an analogue output port, and FET (D4) is switched to supply
15 battery power to said DC-DC converting unit (20, 20', 120).

8. An apparatus for maintaining and supplying stable power to a skin care device as claimed in claim 7, wherein said main switch has a function that a switch-in (SW_IN) signal is inputted to said analogue input port (AN5) for
20 activating said CPU through a second switch unit (32)

9. An apparatus for maintaining and supplying stable power to a skin care device as claimed in claim 7, further comprises a photo-coupler (ISO1) and a phototransistor with a function that an output to the first switch unit (31, 131) from
25 the CPU is carried out by switching of the FET (D4) by activating the photo-coupler (ISO1) of the phototransistor.

10. An apparatus for maintaining and supplying stable power to a skin care device as claimed in claim 9, wherein said DC-DC converting unit (20) further
30 comprises a voltage-measuring unit and a switching element for performing switching according to a PWM control signal from the CPU, said PWM control

signal having a certain duty ratio that activates said switching element to switch on and off for controlling the pulse width.

11. An apparatus for maintaining and supplying stable power to a skin care device as claimed in claim 10, further comprises a function of a PWM control signal which prolongs a switching-on stage for gradually increasing voltage up to the operating voltage during the step-up stage, and inversely shortens a switching-off stage for gradually decreasing the operating voltage during the step-down stage.

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12. An apparatus for maintaining and supplying stable power to a skin care device, comprising
a DC-DC converting unit (20) for escalating the voltages from a charged battery power source (1),

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a skin-stimulating unit (50), including a supersonic element or an ion-inducting element,,

a switch unit (30) having a main switch (SW1) and various functional switches,

an LCD displayer (40) for indicating various operating modes,

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a CPU (2) for controlling each component,

a strength-adjusting switch (SW3) for controlling the strength of the output voltage of the DC-DC converting unit, and

a mode switch (SW2) for operating various modes of supersonic vibrations controlled by each vibrating frequency.

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13. An apparatus for maintaining and supplying stable power to a skin care device as claimed in claim 7, wherein said DC-DC converting unit further comprises a voltage-measuring unit and a switching element for performing switching according to a PWM control signal from the CPU, said PWM control signal having a certain duty ratio that activates said switching element to switch on and off for controlling the pulse width.

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14. An apparatus for maintaining and supplying stable power to a skin care device as claimed in claim 13, further comprises a skin contact sensing unit (60) for detecting whether a vibrating part has contact with the user's skin and a
5 function of automatic step up the operating voltage when said skin detecting unit senses contact with the user's skin.

15. An apparatus for maintaining and supplying stable power to a skin care device as claimed in claim 14, further comprises a heat-detecting unit (70) and a
10 safety control function for rapidly shutting off power when an unusual operation is detected due to overheating or an electric hazard.

16. An apparatus for maintaining and supplying stable power to a skin care device as claimed in claim 15, wherein said heat-detecting unit (70) further
15 comprises a first heat sensor (71) for sensing the surface temperature of the vibrating plate and a second heat sensor (72) for sensing the temperature of a vibrating element (54) and a switching element.

17. An apparatus for maintaining and supplying stable power to a skin care
20 device equipped with a DC-DC converting unit for escalating the voltages from a charged battery power source, a skin-stimulating unit including a supersonic element or an ion-inducting element, a switch unit having a main switch and various functional switches, an LCD displayer for indicating various operating modes, and a CPU for controlling each component, comprises,

25 a voltage amplifier (51) for amplifying voltages according to the control signals,

a supersonic vibrator (ULTRA1) being activated by the amplified voltage,

a resonance unit (53) that resonates with free vibration that occurs when a pulse accesses the amplified voltage,

30 a vibration-generating unit (54) attached to the resonance unit (53),

a vibrating unit (52) for vibrating the supersonic vibrator using power

transmitted from the vibration-generating unit (54), and

a skin contact sensing unit (60) for sensing skin contact and feeding back the signals to the vibration-generating unit (54).

5 18. An apparatus for maintaining and supplying stable power to a skin care device as claimed in claim 17, wherein said skin contact sensing unit (60) further comprises a current sensing unit (61) connected to the vibration-generating unit (54) and an amplifier (62) for amplifying and transmitting the sensed signal to the control unit.

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19. An apparatus for maintaining and supplying stable power to a skin care device as claimed in claim 18, further comprises a control unit for transmitting a control signal to said supersonic vibrator (ULTRA1) and a voltage strength adjusting unit for adjusting the output voltage of the DC-DC converting unit (20) according to the signal from the control unit.

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20. An apparatus for maintaining and supplying stable power to a skin care device as claimed in claim 19, further comprises a displaying unit (40) for displaying each of operating mode and skin-contacting status.

20 21. A LED displayer equipped with a minimum number of connecting pins for indicating various operating modes in a portable skin care device comprises;

a first and a second LED (D6, D7) connected in opposite directions, but disposed between the first input-output terminal (RB2) and the second input-output terminal (RB3) in parallel,

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a third and a fourth LED (D8, D9) connected in opposite directions, but disposed between the second input-output terminal (RB3) and the third input-output terminal (RC0) in parallel,

a fifth and a sixth LED (D11, D13) connected in opposite directions, but disposed between the third input-output terminal (RC0) and the fourth input-output terminal (RC1) in parallel, and

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a seventh LED (D14) connected between the first input-output terminal (RB2)

and the fourth input-output terminal (RC1),

wherein each LED is independently activated to turn on and off according to each signal of input-output terminal from a controlling unit of CPU.

22. An LED displayer as claimed in claim 21, wherein said first to sixth LEDs
5 are usually used for adjusting the strength of modes, and said seventh LED is for displaying the status of the skin care device operation.